

Integrating an E-Learning Information System into The Classroom to Engage IT Undergraduate Students in Non IT Content

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Abstract

This paper presents a comparative case study of the challenges of teaching non-IT content to IT undergraduates. Data was collected over five semesters via a standard University student survey to show how the integration of ELearning Information Systems (ELIS) has led to improved student satisfaction within an undergraduate IT subject. Results from the surveys are discussed in relation to the change history of the subject and indicate that continually updating content and delivery methods (no matter how static the subject area) can lead to improved outcomes. With further development, the combination of collaborative group work and an ELIS will provide an enhanced learning experience for students.

Keywords

ELearning, Information Systems, Collaboration, Group Work

1. INTRODUCTION

From regular surveys conducted at our University, it appears apparent that many IT undergraduate students believe that undertaking subjects which have non IT related subject content should be consigned to a list of last choice electives. Students have to be made aware that it is necessary for them to gain the fundamental knowledge of other domain specific content to 'round' out their studies. IT academics must change the thought process of their students and find effective methods of achieving engagement in non-domain specific content through alternate teaching and learning methods such as an interactive ELearning tool.

For ELearning to be successful and engage participants, the associated information system (IS) must be functional, appropriate to the subject content and deliver a quality service. Putting an IS into action helps organize methods and processes. However, when transferred to the ELearning sphere, the information, content delivery and services offered are often inadequate due to limited availability of resources or poor training undertaken by academics. To ensure the required outcomes are achieved, Wan (2012) suggests the impact of ELearning on the quality of teaching and learning requires more investigation

The aim of this paper is to report on the efforts made to enhance IT student engagement in non-IT content through the introduction of an ELearning Information System (ELIS) within a finance related subject in an undergraduate IT degree. The paper is structured as follows. Firstly an overview of the relevant literature is presented. This is followed by the case study and the findings from the research. Finally, conclusions are drawn and options for future research are presented.

2. LITERATURE REVIEW

As educational technology and associated fields continue to evolve, conflicting findings have emerged regarding ELearning environments. In addition some researchers use the terms distance

learning and ELearning interchangeably (Guri-Rosenblit, 2005, Selwyn, 2010) without considering the mechanics of content delivery . ELearning should not be confused with distance education. Distance education by its very definition, denotes the geographic separation of the learner from the instructor (Guri-Rosenblit, 2005) whereas ELearning is a tool to compliment face-to-face teaching by delivering content and other instructional materials via technology based information systems (IS).

In reviewing literature on IS in an ELearning context, theorists such as Saba (2012) state that an important goal of ELearning systems is to deliver instructions that can produce equal or better outcomes than face-to-face learning systems, and that an understanding of systems quality, information quality and learning outcomes is required in the ELearning sphere. Wan (2012) notes ELearning has yet to make a significant impact on the quality of teaching and learning and pedagogical innovation. To date, the investments in ELearning tend to focus on the management of courses and are concerned with the automation of content delivery for teaching and learning. Conversely, Mar (2005) believes the major impact of ELearning is on the quality of content, which enables lifelong learning.

Selwyn (2010) points out that educational technology has become dominated by an interest in the process of how people learn rather than the how the technology can assist the learning process. Educational technology can be a challenging for academics, as finding the time to implement a new learning system into their course is complex. Many have tried and subsequently failed and as Bain (2012) notes, there is an obvious lack of fundamental understanding of the requirements needed for introducing an ELIS into coursework and the implementation is not straightforward. Time-poor academics struggle with incorporating information into an ELIS that will deliver the correct content, provide student satisfaction, and deliver an overall quality system deemed worthy of deployment at their University.

However, for ELearning systems to improve teaching and learning quality or become mechanisms for lifelong learning, an appropriate framework for ELIS development and implementation must be present. Such a framework would assist with subject integration through improved functionality and system reliability. Abdellatief (2011) suggested evaluating ELearning from a developers' view by investigating three elements, namely service content, system functionality, IT system reliability.

Functionality and system reliability fit neatly under the Information Technology Infrastructure Library (ITIL) framework of Service Delivery, which includes the essential processes to deliver and improve quality (Cartlidge et al, 2007). Schewe et al (2005) propose that the dissemination of subject content or information can be enhanced by extending Abdellatief's (2011) three elements (service content, system functionality, IT system reliability) via best practice framework guidelines for web-based ELearning systems. Other frameworks for ELIS development and deployment have also been proposed for example Khan (2004) offers a People-Process-Product framework while MacDonald et al (2001) suggest that appropriate content, delivery and service coupled with a quality structure act as a means to achieve various learner outcomes in web-based learning.

Maznevski (1996) notes that active involvement in learning increases what is remembered, how well it is assimilated by the student and how it is applied to new situations. This is, in part, because students need to think about what they are doing. Context is important in learning, and the concept of situated learning (Lave 1996) is a key element in engaging students. Participating in activities that maximize learning allows students to grasp not only intended outcomes but also the underlying context on which the activity was based. Learning then becomes an experience and provides students with the knowledge to perform effectively.

Group work improves communication and understanding among students (and also academics and students). Burns and Myhill (2004, p. 36) suggest understanding evolves from 'interactive, social situations, scaffolded by, and in collaboration with, others'. Tsui (2004) notes discussion creates a shared space for learning where students identify key aspects of a topic and the teacher obtains an appreciation of this learning experience and then attempts to broaden the common ground of understanding among all parties.

Enyedy and Goldberg (2004, p. 906) note that pedagogy has shifted 'away from an exclusively individualistic, psychological view on learning toward a perspective of learning involving participation in social interactions within the context of a community'. When students enjoy a class they are more likely to achieve better outcomes, keep their attention levels high and therefore improve understanding of the content delivered. Engaging students in the learning process is

particularly relevant when undertaking subjects which deliver content that is not considered appropriate to their field of study.

3. INTEGRATING ELEARNING IS INTO THE CLASSROOM

This research uses a comparative case study as the intention of the research was to investigate the area under study in some depth and obtain a valuable insight of the given context (McGovern 2003; Morse & Richards 2002). The chosen approach is based on Feyerabend's epistemological thesis that research paradigms need not be limited to a specific method, but rather explored with an open-minded attitude regarding research design (Antimatter, 2011). This approach allows an open-minded interpretation of the collected data as the researcher is interested in looking for the "Why and not the How".

During the last five Autumn semesters (2009 through to 2013), a subject titled 'Finance and IT' (F&IT) has taught non-IT specific content to IT undergraduate students where a major issue faced by the teaching academics has been engaging these students in this non-IT content. A standard University student feedback survey (SFS) has been conducted each semester and this survey data is the basis of this comparative study of integrating ELearning of non-IT content into the IT curriculum. The survey comprised six scale questions (quantitative data) and two freeform questions (qualitative data).

The survey consisted of six questions and used a five point scale as follows: 5 - Strongly Agree, 4 - Agree, 3 - Neutral, 2 - Disagree and 1 - Strongly Disagree. The questions were:

- The subject was delivered in a way which was consistent with the stated objectives
- My learning experiences in this subject were interesting and thought provoking
- I found the assessment fair and reasonable
- There were appropriate resources available to support the subject
- I received constructive feedback when needed
- Overall I am satisfied with the quality of this subject

In addition the survey also comprised two free form answer questions as follows:

- What did you like particularly in the subject?
- Please suggest any improvements that could be made to the subject

Freeform questions were analyzed to identify common themes among the responses (McGovern 2003, Morse & Richards 2002) in order to consolidate these preliminary findings. Four key themes emerged from this qualitative data: 1) changes in course effectiveness, 2) changes in teaching staff; 3) the use of an ELIS and 4) the introduction of collaborative group work.

The table below shows the number of students per semester who participated in the subject survey.

Table 1: Respondent numbers and percentages

Semester	Total Students	No. of Respondents	Percentage
Autumn 2009	148	58	39
Autumn 2010	128	53	41
Autumn 2011	168	65	39
Autumn 2012	163	72	45
Autumn 2013	174	56	32

Figure 1 below presents a comparison of the five semesters of the student feedback surveys by question and shows a steady increase in student satisfaction during the measurement period.

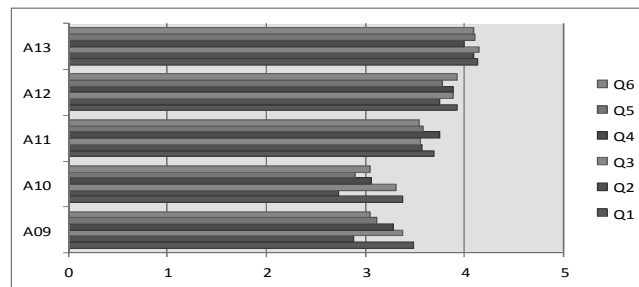


Figure 1: Comparative results of the student feedback surveys over 5 semesters

3.1 The Subject Improvements

Since its inception in 2009 F&IT has been through three versions. In the first version of the subject (Autumn Semesters 2009 and 2010) the subject was very accounting based with numerous practical tasks requiring knowledge of both accounting principles and Microsoft Excel to undertake these tasks. For the second iteration of the subject (Autumn semesters 2011 and 2012) the lecture component was changed to cover financial principles rather than accounting principles and terminology and Pearson's MyFinanceLab (MFL) was used for the practical components of the subject was amended. In the current iteration of the subject (2013) the lecture component was amended to cover concepts related to finance for IT businesses and collaborative group work was introduced for the tutorial group work.

3.1.1 Changes in Course Effectiveness

The results presented in Figure 1 in the previous section a steady increase in student satisfaction with the subject over the five semesters where data has been collected. The change in content over the three iterations of the subject has no doubt had an impact on the scores obtained from the student feedback surveys.

In the 2009 and 2010 offering of the subject the lecture material and practical components of the subject which were neither engaging nor realistic for IT students, as indicated in the SFS. The lecture material focussed mostly on accounting principles, terminology and example transactions while the practical component was heavily focused on understanding and processing accounting transactions and required a detailed understanding of Excel to produce the appropriate accounting statements.

For the 2011 and 2012 offerings, the subject moved away from its accounting base, with the lecture and practical components of the subject focusing on financial principles. This removed the need for IT students to become familiar with, and understand accounting principles and terminology, as the emphasis shifted to understanding financial management and reporting. The practical component utilized MFL and removed the need for students to work with Excel to process numerous accounting transactions on a weekly basis.

In 2013, the lecture content of the subject focused on presenting concepts related to finance for IT businesses. While the practical component was undertaken through collaborative group work among students where IT businesses were set up and appropriate financial transactions and reporting were undertaken.

Table 2 highlights student comments taken from the 2010 through 2013 student surveys which indicate support for the change in subject content from an accounting to financial management focus. The 2010 student survey comments support this notion of a heavily focused accounting subject, the 2011 and 2012 student surveys indicated support for the change to financial management and the use of the MFL application, while the 2013 also predominantly support the changes made to the subject structure.

Table 2: 2010 – 2013 Student comments about subject content

Positive	Negative
“Material available is comprehensive and well documented with in depth analysis of concepts and definitions” (2010)	“Some notes are unnecessarily complex for a subject that doesn't assume any previous knowledge/experience in finance” (2010)
“it gives us a fundamental of finance and it since IT students don't learn finance, however somehow we just need it to understand it” (2010)	“Too much material is covered in each weeks lecture. Some concepts are difficult for students with non-business backgrounds and insufficient time is given to these topics” (2010)
“My Finance lab was good. Very easy to self-learn, particularly if you had the textbook. I loved especially how they linked you to the pages in the text book. And I very much loved the show me an example thing for questions, particularly when some questions couldn't be found in the book”. (2011)	“The subject has been named FINANCE AND IT. And therefore, the finance taught in the subject should be moulded to suit especially the IT students wanting to pursue managerial roles” (2011)
“[The lecturer] used real world examples sometimes (e.g. tax, credit rating, airplanes etc) so we could see that finance is actually applicable in these cases” (2011)	“The subject is called "Finance and IT" however it has nothing to do with IT! Please rename the subject so other students do not make the same mistake I did” (2011)
“The way [the lecturer] conducts her lectures and makes the subject interesting and fun to learn. The online labs are a really good way to learn this subject and fully understand the formulas” (2012)	“We need more material for this subject to help us understand the concepts” (2012)
“I like the fact that Finance and IT concepts are balanced and that it does not involve too much of accounting formulae or maths in general. It provides a perfect balance as the name of the subject suggests” (2013)	“... IT people, don't need finance. [The Faculty] should remove this from core subject into an elective” (2012)
“A very practical subject which is something that I think benefits me more than a typical theory subject” (2013)	“There is no point to this subject and there is no direction. There is absolutely no IT component and only includes some basic concepts of business which I learnt in first year” (2013)
“The lectures were so well documented and were presented in a clear and structured manner. The flow of the lecture allowed for questions or comments. The topics were interesting and useful” (2013)	“the subject does not seem to relate at all to finance nor IT” (2013)

3.1.2 Changes in Teaching Staff

To coincide with the change in content in 2011 the academic instructor for the subject changed as the original instructor retired. This change in staff also drove the change in lecture content as one of the original tutors took over the lecturing component. Having had experience with the subject content in both the 2009 and 2010 offerings the new lecturer had a sound understanding of the problems being faced by students in relation to the accounting content. The subject content was drastically changed as both the lecture and practical components of the subject were aligned to an Australian textbook which also encompassed an online component accessible via MFL.

Table 3 lists appropriate comments taken from across all student surveys indicate that the change in teaching staff had an overall positive outcome for the subject.

Table 3: Student comments on teaching staff

Positive	Negative
"I enjoyed TRYING to learn accounting" (2010)	"[The lecturer] talks about material as though the students already have a background in Accounting" (2010)
I had no understanding of finance whatsoever. But my tutor was fantastic and was always willing to help me through the problem step by step if I needed any help. "[The lecturer] made the lectures interesting even with material that was so boring, I can't imagine having any other lecturer" (2012)	"[The lecturer] does not explain things in great detail sometimes when more detail is needed" (2011)
"The way [the lecturer] conducts her lectures and makes the subject interesting and fun to learn" (2012)	"More communication between students and tutors" (2012)
"[The lecturer] was able to teach the subject well and create an enjoyable environment. In my opinion best tutor/lecture I've had so far in my uni life" (2013)	"The tutor also seems clueless - not understanding any basic principles of accounting (which is considered necessary, although to demonstrate the use of 'double entry bookkeeping, which is an important part of accounting, a simple YouTube video was shown during the lecture - perhaps a reflection on the quality of teaching)" (2013)

3.1.3 The Use of ELearning ISS

A significant factor of why the survey scores improved was the move away from Excel and transaction processing to the use of an ELIS for the practical component of the subject.

The successful integration of an ELIS in coursework has been documented in the literature. In one study on students who participated in a trial of ELearning versus traditional learning, Alsabawy & Cater-Steel (2012) found ELearning to be an effective method and deepened the student understanding of the subject. This was also supported by Jones and Gregor (2006) who suggested that an IS used to support learning has a distinct advantage over competitors that do not integrate ELIS into their coursework.

Another factor we believe improved the survey scores was the move away from Excel and transaction processing to the use of an ELIS for the practical component of the subject. In 2011 and 2012 the subject utilized the MFL application which provided students with an ELearning tool consisting of online examples with explanations, weekly tutorial quizzes and practical questions and online help facilities. This ELIS was also used for assessment items in the subject (a mid-semester exam and an assignment). Hence a technical understanding of both accounting and Excel was not needed to successfully complete the practical component of the course.

The second ELIS to be used was a toolbox from The Australian Flexible Learning Network. The use of a learning-assisted toolbox titled 'A Balancing Act' enabled the students to self-pace their learning of key concepts to help them achieve a positive learning outcome as per the SFS feedback. The toolbox provided students with case studies, exercises, examples with explanations and a series of templates to be used to produce financial reports.

Comments taken from the 2011, 2012 and 2013 surveys regarding the use of the two ELIS's are shown in table 4 and show that in the main students were very positive in this regard.

Table 4: Student comments regarding the eLearning IS

Positive	Negative
The integrated online component, allowed students to do their work anywhere and still learn deep content" (2011)	"there is too much reliance on the Pearson education online application" (2011)
"The new online format was great, I am a practical person and hence the online questions were fantastic ways for me to improve my knowledge" (2011)	"The online material should explain the correct result of the quizzes and lab so that we IT people don't get headaches on how to achieve the final result" (2011)

“MyFinanceLab provides step-by-step instructions on how to calculate financial concepts such as Net Present Values and Relevant Cash Flows” (2012)	“The labs should be compulsory students would learn a lot more if they showed up. Then again, it was a lot easier going to a lab with only 5 other people” (2012)
“I liked being able to do the labs from home, made the subject so much easier to get through” (2012)	“More work needs to be put into providing worked solutions to students, this would benefit them greatly” (2012)
“The subject was quite hands on. The trading was very good and a great learning experience” (2013)	“ensure that groups trade with other companies created in tutorials.” (2013)

3.1.4 The Introduction of Collaborative Group Work

The introduction of collaborative group work in conjunction with the second ELIS for the practical component of the subject in the Autumn semester 2013 is also considered as another factor for the improved survey scores. This collaborative group work was used in conjunction with the Flexible Learning Toolbox (FLT) as a means to engage the students in the practical work. While the collaborative group work was the driver behind the engagement of students, the toolbox IS was used to help students produce the outputs required for the subject. The collaborative group work encompassed the setup of a virtual business and the ability to work on industry based scenarios each week.

Comments taken from the 2013 survey are shown in table 5 and highlight the student satisfaction with the practical component of the subject being totally reliant on group work.

Table 5: Student comments concerning group work

Positive	Negative
“One of the best parts of this subject is that it forces groups to trade with each other between tutorials. A great experience- it's a shock at first but it's a fantastic experience for students”.	“the tutorial work is pointless and has no reflection on anything at all - setting up a business is not as simple as [just] arbitrarily throwing scenarios at these businesses each week does not really have any meaning”
“The tutorial activities - i.e. Virtual Business. Really helps when you're able to apply concept to real life situations”	“ensure that groups trade with other companies in tutorials. I have heard one person made up their trades”
“Meeting up with group members, slacking off in class, having a reason to talk to the pretty girls”	“make it easier to trade with other groups and introduce fake trades/companies”

5. REFLECTIONS ON ENGAGING STUDENTS

Through a series of changes, the subject Finance and IT has delivered improved outcomes for both students and academic staff. This can be witnessed in the results of the standard University student surveys taken over the last five years in both the scale questions and the free-form student comments. Reflecting on why the subject has delivered better student learning, a number of factors come to light which may or may not have been reflected in the survey data presented in this paper.

The major driver has been in the area of student engagement with the subject content (both theory and practice). This shift from accounting principles, terminology and Excel transaction processing to financial management and online practical materials has made the subject less theory-based and more engaging. The online learning environment coupled with the collaborative group work has seen students engage with the content through the use of practical and experience based scenarios as opposed to the previous theory-based learning approach.

Another driver was the change in teaching staff. The original academic (a former accountant) clearly had a preconceived idea about what type of content students needed to grasp and how to teach this content. The results from the surveys would suggest that this was not accepted by the students. The new academic staff member (a former finance manager) was amenable to change and very proactive in re-writing content and determining the best means to engage students in the practical

components. Hence, the introduction of MFL mostly received good responses from the two student cohorts.

As the first ELearning application used in the subject, MFL paved the way for improved student outcomes. Several issues were encountered with MFL including being a third party application, relying on multiple choice questions more than practical questions and allowing students the ability to have multiple attempts at attaining the correct answer. However, the concept of the ELearning application was the right direction for the subject and the second application, the FLT, was incorporated into the subject this year.

The FLT coupled with the collaborative group work concept provided the final (to date) component in the improvement of this subject. Providing a toolbox consisting of examples, tools and techniques from which their practical group work could be based has ensured an engaging learning experience for all students.

The introduction of the collaborative group work experience allowed interaction among all groups in the subject (both in their own tutorial and all other tutorials) as the groups 'traded' with each other to compile a set of financial reports. In fact, one of the authors commented that this collaborative group work produced the most engagement among students witnessed in the author's 10 year academic career.

6. CONCLUSIONS AND FUTURE RESEARCH

This paper has reported on information collected from the standard SFS conducted by the University. The findings have shown that engaging students in subject content relies on more than the delivery of material through various medium. Students are more engaged when working in groups and when coupled with the ability to collaborate across groups, the learning environment provides an appropriate means to foster improved student outcomes.

ELearning, although introduced more than two decades ago, still has a long way to go in order to provide suitable benefits to developers, academics and student. Hence, an appropriate ELIS combined with collaborative group work is a viable option to engage students in content which is not from their specific area of study.

Future research will analyse data previously collected from enrolled students via an individual open-ended questionnaire (2011 and 2012) and a directed in-class group presentation (2013). Both mechanisms gained student feedback on the operation of the subject and areas where content could be improved and additionally in 2013 each student group provided feedback on how group work could be improved. From this feedback, themes will be identified and explored in more detail to further improve the operation of the current ELIS. It is also envisaged that the current ELIS will be evaluated using an appropriate framework (see for example Abdellatief 2011, Khan 2004, MacDonald et al 2001 or Schewe et al 2005).

Also, future research will endeavour to expand ELIS research by investigating an individual's learning perspective using information systems in an ELearning context. This will benefit not just the specific subject discussed in this paper but potentially any ELIS implementation and ensure easy integration for academics no matter what the subject content involves. A major aim of the future study is to analyse traditional theories of self-regulated learning and compare these to new categories which are derived from work both within and across groups.

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